

## CLAIMS

1. A method of fast archiving of audio in a digital jukebox comprising the steps of:  
saving a set of audio signals representing an audio segment in uncompressed format in a memory device of the jukebox; ✓

5 when the jukebox is not providing a set of audio signals in an uncompressed format for playing, retrieving a set of uncompressed format audio signals, converting the retrieved set to a compressed format and saving the compressed format set in the memory device. ✓

10 2. The method of claim 1 wherein the step of converting the uncompressed set of audio signals comprises converting at a rate in the general range of from one to two times real time.

3. The method of claim 2 wherein the step of converting comprises converting using a digital signal processor.

15 4. The method of claim 1 comprising the step of erasing an uncompressed format set of audio signals from the memory device after that set has been converted to the compressed format and stored in the memory device.

5. A method for storing sets of signals in a compressed format in at least one memory device from sets of signals in an uncompressed format, comprising the steps of:

storing one or more uncompressed format sets of signals in a memory device;

compressing each uncompressed format set of signals; and

20 storing each compressed format set of signals in the memory device or in another memory device.

6. The method of claim 5 comprising the step of making available for future storage memory space in the memory device in which a set of uncompressed format signals is stored after that set of signals has been compressed.

25 7. The method of claim 5 comprising the step of retrieving each uncompressed format set of signals from the memory device for compression after at least a substantial part of the respective set has been stored therein.

30 8. The method of claim 5 wherein the steps of storing uncompressed format sets of signals and storing each compressed format set of signals comprise storing the respective sets of signals in different parts of the same memory device. ✓

9. The method of claim 8 wherein the steps of storing uncompressed format sets of signals and storing each compressed format set of signals comprise storing the respective sets in a computer readable disc.

10. The method of claim 5 wherein the steps of storing uncompressed format sets of signals and storing each compressed format set of signals comprise storing the respective sets in different memory devices.

11. The method of claim 5 wherein the step of storing uncompressed format sets of signals comprises storing each uncompressed format set in a computer readable electronic memory, and the step of storing each compressed format set of signals comprises storing each compressed format set of signals in a computer readable hard disc.

12. The method of claim 5 wherein the step of storing uncompressed format sets of signals comprises storing one or more uncompressed format sets of digital signals, and wherein the compressing step comprises compressing according to MP3 format. ✓✓

13. The method of claim 12 wherein the steps of storing sets of signals and compressing each set of stored signals comprise storing and compressing sets of signals representing audio.

14. The method of claim 5 wherein the steps of storing sets of signals and compressing each set of stored signals comprise storing and compressing sets of signals representing segments of audio.

15. The method of claim 6 wherein the step of storing uncompressed format sets of signals comprises storing more than one set of uncompressed format signals in the memory device, and wherein the step of compressing each set of signals comprises retrieving one set of signals at a time and compressing one set of signals at a time.

16. The method of claim 5 wherein the steps of storing uncompressed format sets of signals and storing each compressed format set of signals comprise storing the respective sets of signals in different parts of the same memory device, and comprising the step of making available for future storage memory space in the memory device in which a set of uncompressed format signals is stored after that set of signals has been compressed.

17. A method for storing sets of digital signals in a compressed format in a computer readable disc storage device, each set representing a segment of audio, comprising the steps of:

storing one or more sets of signals in an uncompressed format in the storage device;  
retrieving an uncompressed format set of signals from the storage device; ✓  
compressing the retrieved uncompressed format set of digital signals;  
storing the compressed format set of signals in the storage device; and ✓

5 making available for future storage space in the storage device in which the set of  
uncompressed format signals is stored after that set of signals has been compressed.

18. The method of claim 17 wherein the step of retrieving each uncompressed format  
set of signals from the memory device for compression comprises retrieving the set after a part of  
the set has been stored in the storage device.

10 19. The method of claim 17 wherein the compressing step comprises compressing  
according to MP3 format.

20. The method of claim 17 wherein the step of storing uncompressed format sets of  
signals comprises storing more than one set of uncompressed format signals in the storage  
device, and wherein the steps of retrieving each uncompressed format set of signals and  
15 compressing each set of retrieved signals comprises retrieving one set of signals at a time and  
compressing one set of signals at a time.

21. The method of claim 17 wherein the compressing step comprises compressing  
sets of digital signals according to MP3 format.

22. A method for storing sets of digital signals in a compressed format in at least one  
20 memory device, each set of compressed format digital signals representing an audio segment,  
and for later retrieving a set of the stored compressed format digital signals for converting the set  
of compressed format digital signals into a set of uncompressed format signals suitable to be  
played to sound the respective audio segment, the method comprising the steps of:

storing one or more uncompressed format sets of signals in the storage device;

25 compressing an uncompressed format set of stored digital signals;

storing the compressed format set of signals in the storage device;

wherein the compressing step and the decompressing step are performed according to a  
predetermined priority and not at the same time.

23. The method of claim 22 wherein the predetermined priority comprises only performing the compressing step when there is no pending request to perform the decompressing step.

24. The method of claim 22 comprising the step of retrieving respective uncompressed format sets of stored digital signals only after the respective entire uncompressed format set has been stored in the storage device, and wherein the compressing step comprises compressing the retrieved uncompressed format set of digital signals.

25. The method of claim 24 wherein the step of retrieving each uncompressed format set of signals from the memory device for compression comprises retrieving the uncompressed format set after a part of the set has been stored in the storage device.

26. The method of claim 22 wherein the compressing step comprises compressing according to MP3 format.

27. The method of claim 24 wherein the step of storing uncompressed format sets of signals comprises storing more than one uncompressed format set of signals in the storage device, and wherein the steps of retrieving each uncompressed format set of signals and compressing each uncompressed format set of retrieved signals comprises retrieving one uncompressed format set of signals at a time and compressing one uncompressed format set of signals at a time.

28. A system for receiving sets of signals in an uncompressed format, converting the uncompressed format sets to sets of digital signals in a compressed format, and storing the compressed sets of signals in at least one memory device, each respective uncompressed and compressed format set of signals representing a respective audio segment, comprising:

one or more memory devices;

a processor coupled to the memory, the processor being programmed to:

store in the memory device an uncompressed format a set of signals input to the processor,

retrieve an uncompressed format set of signals after at least a substantial part of the set is stored in the memory device,

convert the retrieved uncompressed format set of signals to a compressed format set of signals,

store the compressed format set of signals in the memory device or in another memory device, and

make available for future storage memory space in the memory device in which the uncompressed format set of signals are stored after that set has been converted to the uncompressed format.

29. The system of claim 28 wherein the processor is programmed to retrieve a compressed format set of signals stored in the memory device, and convert the retrieved compressed format set of signals to an uncompressed format suitable to be played to sound the corresponding audio segment.

30. The system of claim 29 wherein the programming assigns a priority to converting an uncompressed format set of signals to a converted format and converting a compressed format set of signals to an uncompressed format suitable to be played to sound the corresponding audio segment.

31. The system of claim 30 wherein the programming provides priority to converting a compressed format set of signals to an uncompressed format set of signals.

32. The system of claim 28 wherein the process comprises a programmed digital signal processor.

33. The system of claim 28 wherein the process comprises a programmed digital signal processor and a programmed controller.

34. The system of claim 28 wherein the memory device comprises a computer readable disk, and wherein the programming causes both uncompressed format and compressed format sets of signals to be stored on the disk.

35. A method for dynamically allocating memory space on a computer readable and writable disk, comprising the steps of:

allocating a first space on the disk for storing sets of signals input to the disk in an uncompressed format;

allocating a second space on the disk for storing sets of signals in a compressed format converted from respective uncompressed format sets of signals stored in the first space; and

erasing memory space in the first space in which the uncompressed set of signals is stored that was converted to the compressed format and stored in the second space.

36. The method of claim 35 comprising the step of allocating a third space in the disk for each uncompressed format set of signals stored in the first space, the third space being allocated for use in converting the respective uncompressed format set to a compressed format set.

37. The method of claim 35 comprising the step of providing a buffer space between the first and second spaces.

38. The method of claim 35 comprising the step of providing a buffer space at least between the first and third spaces.

39. A computer readable and writable disk structured as follows:  
a first space on the disk allocated for storing sets of signals input to the disk in an uncompressed format;

a second space allocated on the disk for storing sets of signals in a compressed format converted from respective uncompressed format sets of signals stored in the first space; and

a third space allocated on the disk for operations in converting an uncompressed format set of signals to a compressed format set of signals.

40. The computer readable and writable disk of claim 39 comprising a buffer positioned between the first and third spaces.

41. A user interface for a music jukebox having a main part and a remote control, comprising:

the remote control having a processor, a display device and an input device, the processor providing information signals to the display device to cause the display device to display information, and receiving signals from the input device;

the jukebox main part having a processor controlling jukebox functions including generation of audio signals suitable to be played to sound audio represented by the audio signals and information signals;

the remote control processor and the jukebox main part processor being coupled for two-way communication such that the remote control processor can provide signals input on the remote control input device to the jukebox part processor, and the jukebox main part processor can provide information signals to the remote control processor responsive to which the remote control processor provides information signals to the display.

42. The user interface of claim 41 comprising cooperating wireless transmitting and receiving circuitry in the remote control and the music jukebox main part by means of which the remote control processor and the jukebox main part processed are coupled for two-way communication.

43. In a music jukebox comprising a storage device for storing sets of digital signal representing audio segments and a processor for controlling storing and retrieving of stored sets of digital signals, the improvement comprising a remote control coupled to the music jukebox for two-way communication between the remote control and the music jukebox, the remote control having a display on which information provided by the music juke box is displayed and an input device via which information is input to the remote control device and provided to the music juke box.

44. The music jukebox of claim 43 comprising cooperating wireless transmitting and receiving circuitry in the remote control and the music jukebox main part by means of which the remote control processor and the jukebox main part processed are coupled for two-way communication.

45. The music jukebox of claim 43 wherein the remote control comprises a processor which provides information to the display received from the music jukebox and information to the jukebox input on the input device, the processor being programmed to provide information to the display defining a prompt to a user in response to the elapse of a predetermined time between the processor providing information to the jukebox input on the input device and the absence of information provided by the jukebox to the processor.

46. In a bit allocation method of compressing digital signals in which the digital signals are separated into frames and the digital signals in each frame are converted into a plurality of frequency sub-bands, for each frame performing the steps of:

determining the maximum allowable step size needed in each sub-band to meet a threshold requirement, and hence the number of bits needed for each sub-band;

computing the total number of bits needed in a frame using the maximum allowable step size determined in the previous step;

if the total number of bits exceeds a predetermined amount, increase the step size for all sub-bands until the total number of bits for a frame does not exceed the predetermined number.

47. In a bit allocation method of compressing digital signals in which the digital signals are separated into frames and the digital signals in each frame are converted into a plurality of frequency sub-bands, for each frame performing the steps of:

computing an NMR threshold in each sub-band in a frame;

quantizing the signals in each sub-band of the frame;

computing a distortion level for each sub-band of the frame;

if for each sub-band of the frame, the distortion level is not equal to the NMR threshold, adjusting the quantization step size until the distortion level is approximately equal to the NMR threshold level;

computing the total number of bits needed to represent the quantized signals for all of the sub-bands of the frame;

if the total number of bits computed exceeds a predetermined number, increasing the quantization step size for all threshold level by a sub-bands until the total number of bits does not exceed the predetermined number.

48. A searchable database for storing information relating to audio, video or multimedia segments, comprising:

a plurality of segment records each storing information relating to a segment;  
a plurality of category records each having a bit size at least equal to the number of segment records and indicating in each bit location whether the corresponding segment falls within the category, the bit locations in each category record being mapped to the segment records.

49. The database of claim 48 wherein the database is stored on a computer hard disk, on which is stored each audio, video or multimedia segment.

50. The database of claim 49 wherein each segment record includes the location at which the segment is stored.

51. The database of claim 48 wherein each segment record includes a title for the segment.

52. The database of claim 48 wherein each audio segment record includes the name of an artist or group rendering the audio represented by the respective audio segment record.

53. The database of claim 49 wherein each record has a 4096 bit capacity.



54. A method for storing information relating to audio, video or multimedia segments in a searchable database, comprising the steps of:

storing in a respective segment record information relating to a plurality of segments;

storing in a plurality of category records, each having a bit size at least equal to the

5 number of segment records, information indicating whether a segment falls within the category;

and mapping segment information in the category records to the segment records.

55. The method of claim 54 wherein each category record includes a single bit location for each segment record.

56. A digital music jukebox comprising:

10 a memory device in which are stored sets of digital signals in a compressed format representing musical selections;

a processor for controlling storing and retrieving of the sets of digital signals;

a database stored in memory in the jukebox containing information which is substantially  
unique relating to respective sets of digital signals representing musical selections;

15 the processor being programmed to identify a set of compressed format digital signals from the database, and provide information relating to the identified set for display, storage in another database or announcing by the jukebox.

57. The jukebox of claim 56 wherein the jukebox includes an input device coupled to the processor for receiving updates for the database.

20 58. The jukebox of claim 57 wherein the input device is a CD-ROM drive, a disk drive, a modem, a connection to a PC, a bar code scanner, a keyboard, or a remote control with a keyboard. ✓

59. A method for providing a database of substantially unique identifications for a sets of digital signals representing respective audio segments, comprising the steps of:

25 selecting a plurality of consecutive bytes of each set starting at a predetermined byte number for each respective set;

encoding the plurality of bytes selected from each set; and

storing the encoded bytes for each set in a searchable database.

30 60. A method of identifying an unknown set of digital signals representing an audio segment using the database of claim 59 comprising the steps of:

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